

Fundamentals of ChemistryM.C.Q's**Q: Multiple Choice Questions:**

- Industrial chemistry deals with the manufacturing of compounds.
(a) In the laboratory (c) on micro scale
(b) **On commercial scale** (d) on economic scale
- Which one of the following compounds can be separated by physical means?
(a) **Mixture** (b) Compound (c) element (d) radical
- The most abundant element occurring in the oceans is:
(a) **Oxygen** (c) nitrogen
(b) Hydrogen (d) silicon
- Which one of the following element is found in most abundance in the earth crust?
(a) **Oxygen** (c) silicon
(b) Aluminium (d) iron
- The third abundant gas found in the earth's atmosphere is:
(a) Carbon monoxide (c) oxygen
(b) Nitrogen (d) **argon**
- One amu is equivalent to:
(a) 1.66×10^{-24} mg (c) **1.66×10^{-24} g**
(b) 1.66×10^{-24} kg (d) 1.66×10^{-23} g
- Which one of the following molecule is not tri-atomic?
(a) **H₂** (c) H₂O
(b) O₃ (d) CO₂
- The mass of one molecule of water is:
(a) **18 amu** (c) 18 mg
(b) 18 g (d) 18 kg
- The molar mass of H₂SO₄ is:
(a) **98 g** (c) 9.8 g
(b) 98 amu (d) 9.8 amu
- Which one of the following is a molecular mass of O₂ in amu?
(a) **32 amu** (c) 1.92×10^{-25} amu
(b) 53.12×10^{-24} amu (d) 192.64×10^{-25} amu
- How many number of moles are equivalent to 8 grams of CO₂?
(a) 0.15 (b) 0.21 (c) **0.18** (d) 0.24
- Which one of the following pairs has the same number of ions?
(a) 1 mole of NaCl and 1 mole of MgCl₂
(b) $\frac{1}{2}$ mole of NaCl and $\frac{1}{2}$ mole of MgCl₂
(c) **$\frac{1}{2}$ mole of NaCl and $\frac{1}{3}$ mole of MgCl₂**
(d) $\frac{1}{3}$ mole of NaCl and $\frac{1}{2}$ mole of MgCl₂
- Which one of the following pairs has the same mass?
(a) **1 mole of CO and 1 mole of N₂**
(b) 1 mole of O₂ and 1 mole of N₂
(c) 1 mole of CO and 1 mole of CO₂
(d) 1 mole of O₂ and 1 mole of CO₂

CHAPTER 1

Fundamentals Of Chemistry

(Exercise Short Questions)

Q1: Define Industrial Chemistry and Analytical Chemistry?

Ans:

The manufacturing of chemical compounds on commercial scale is called **Industrial Chemistry**.

Example: Fertilizer and Textiles

That deals with separation and analysis of a sample to identify its components is called **Analytical Chemistry**.

Example: Food and Water.

Q2: How can you Differentiate Between Organic and Inorganic Chemistry?

Ans:

In which we study the covalent compounds of carbon and hydrogen and their derivatives is called **Organic Chemistry**.

In which we study all elements and their compounds except hydrocarbons and their derivatives is called **Inorganic Chemistry**.

Q3: Give the scope of Biochemistry?

Ans: Applications of biochemistry are in the field of Medicine, Food science and Agriculture etc.

Q4: How does Homogeneous mixture Differ from Heterogeneous Mixture?

Ans:

A mixture having uniform composition throughout is called **Homogeneous Mixture**.

Example: Air and Gasoline.

A mixture having non-uniform composition throughout is called **Heterogeneous Mixture**.

Example: Soil and Rock.

Q5: What is Relative Atomic Mass? How it is related to Gram?

Ans: "The average mass of an atom of an element compared with an atom of carbon-12 isotope is called **Relative Atomic Mass** of an element"

$$1 \text{ amu} = 1.66 \times 10^{-24} \text{ g}$$

Q6: Define Empirical Formula with an Example?

Ans: "It is the simplest whole number ratio of atoms present in a compound"

Example: Benzene (CH) and Glucose (CH₂O)

Q7: State Three Reasons why do you think Air is a Mixture and Water a Compound?

Ans:

a) Air is made up of many gases such as oxygen, carbon

b) We can separate these gases from air physically.

c) By mixing up these gases they have their own properties.

Water is made up of two atoms H₂ and O₂

H₂ and O₂ cannot get separated by physically method.

On mixing up H₂ and O₂ lose their identities.

Q8: Explain why are hydrogen and oxygen considered elements whereas water as a compound?

Ans: Both hydrogen and oxygen have a unique property of valency. This is the property of elements. Water does not have the property of valency. It indicates that water is a compound.

Q9: What is the significance of the symbol of an element?

Ans: Symbols are very important during reaction because we write only symbol of element instead of full name in a chemical reaction.

Q10: State the reasons: Soft drink is a mixture and water is a compound?

Ans: Soft drink have water, sugar, carbon dioxide, colour and taste are the mixed compound. They have no chemical reaction together. That's why soft drink is a mixture whereas water has made up of hydrogen and oxygen by chemical reaction. That's why water is a compound.

Q11: Classify the following into Element, Compound and Mixture?

- | | |
|-----------------------------|---|
| (i) He and H ₂ : | He and H ₂ are Element . |
| (ii) CO and Co: | CO is a Compound and Co is an Element . |
| (iii) Water and Milk: | Water is a Compound and Milk is a Mixture . |
| (iv) Gold and Brass: | Gold is Element and brass is a Mixture . |
| (v) Iron and steel: | Iron is an Element and steel is a Mixture . |

Q12: Define Atomic Mass Unit? Why is it needed?

Ans: The unit used for relative atomic masses called **atomic mass unit**, with symbol "amu". It is used to compare masses of atom because we cannot measure it with any balance.

$$1 \text{ amu} = 1.66 \times 10^{-24} \text{ g}$$

Q13: State the nature and name of the substance formed by combining the following:

(i) Zinc+Copper	It is a mixture or alloy. The name of alloy is brass
(ii) Water+Sugar	It is a mixture. The name of mixture or solution is syrup
(iii) Aluminium + Magnesium	It is a mixture or alloy. The name of alloy is magnalium.
(iv) Iron+Chromium +Nickel	It is a mixture or alloy. The name of alloy is stainless steel.

Q14: Differentiate between Molecular mass and formula mass, which of the followings have molecular formula? H₂O, NaCl, KI, H₂SO₄

Ans:

The sum of atomic masses of all the atoms present in one molecule of a molecular substance is called Molecular mass	The sum of atomic masses of all the atoms present in one formula unit of a substance is called Formula mass .
Example: Chlorine (Cl) is 71.0 amu	Example: Sodium Chloride (NaCl) is 58.5 amu
<ul style="list-style-type: none">H₂SO₄ and H₂O are the Molecular formula While NaCl and KI are the Ionic compound.	

Q15: Which one has more atoms: 10 g of Al or 10 g of Fe?

Ans: 10 g of Fe has less atoms While 10 g of Al has more atoms.

Q16: Which one has more molecules: 9 g of water or 9 g of sugar?

Ans: 9 g of water has more atoms while 9 g of sugar has smaller atoms.

Q17: Which one has more formula units: 1 g of NaCl or 1 g of KCl?

Ans: 1 g of NaCl has more formula units and 1 g of KCl has low formula units.

Q18: Differentiate between homoatomic and heteroatomic molecules with examples?

Ans:

A molecule which have same type of atoms.	A molecule consist of different kinds of atoms.
Example: H ₂ , N ₂ etc	Example: HCl, H ₂ O etc

Q19: In which one of the following the number of hydrogen atoms is more?
2 moles of HCl or 1 mole of NH₃

Ans: 1 Mole of NH₃ is more atoms **Because:**

HCl have one molecule in one H atoms=1

$$\begin{aligned}\text{HCl have two mole in H atoms} &= 2 \times 6.02 \times 10^{23} \\ &= 12.04 \times 10^{23} \\ &= 1.204 \times 10^{24} \text{ atoms}\end{aligned}$$

NH₃ have one molecule in H atoms=3

$$\begin{aligned}\text{NH}_3 \text{ have one mole in H atoms} &= 3 \times 6.02 \times 10^{23} \\ &= 18.09 \times 10^{23} \\ &= 1.809 \times 10^{24} \text{ atoms}\end{aligned}$$

Important Extra Short Questions

Q1: What is Scientific Method?

Ans: A systematic approach used in scientific study is called scientific method.

Q2: Define Chemistry?

Ans: "The branch of science that deals with the composition, structure, properties and reactions of matter is called Chemistry"

It provides understanding of this universe (world). It is concerned with matter and energy.

Q3: What is matter?

Ans: "Anything that has mass and occupies space is called matter"

Q4: Define Substance?

Ans: "A pure matter is called substance"

Q5: What is meant by properties of substance?

Ans: "The characteristic qualities of substances are called properties of substance"

Properties of substances of two types, physical properties and chemical properties.

Q6: Define Physical Properties?

Ans: "Properties that can be observed without changing the composition of the substance are called Physical Properties"

Some Physical Properties are colour, odour, taste, hardness etc.

Q7: Define Chemical Properties?

Ans: "Properties that can be observed only when a substance change in composition are called Chemical Properties"

Some Chemical Properties are Rusting of Iron, Burning of coal etc.

Q8: Define Element? Give example.

Ans: "A pure substance composed of only one kind of atom having the same atomic number is called Element"

Example: Sodium (Na), Copper (Cu) etc.

Q9: Define Metal? Give an example.

Ans: “An element which is a good conductor of heat and electricity is called Metal”

Example: Sodium, Copper, Silver, Gold etc.

Q10: Define Non-Metal? Give an example.

Ans: “An element which is not good conductor of heat and electricity is called Non-metal”

Example: Carbon, Sulphur, Phosphorus, Chlorine etc.

Q11: Define Metalloid? Give an example.

Ans: “An element having physical and chemical properties of both metals and non-metals is called metalloid”

Example: Boron (B), Silicon (Si), Germanium (Ge) etc.

Q12: Define Noble Gases? Give examples.

Ans: “Elements having completely filled valence shell are called noble gases” Only Six elements are noble gases.

Example: Helium (He), Neon (Ne), Argon (Ar) etc.

Q13: Define Symbol? Give examples.

Ans: “An abbreviation used for the name of element is called Symbol”

One-letter symbols		Two-letter symbols	
Name	Symbol	Name	Symbol
Boron	B	Barium	Ba
Carbon	C	Magnesium	Mg

Q14: Define Valency? Give example.

Ans: “The combining capacity of an element with other elements is called valency”

Valency 1	Valency 2	Valency 3	Valency 4
Hydrogen H	Beryllium Be	Boron B	Carbon C
Lithium Li	Magnesium Mg	Aluminium Al	Silicon Si

Q15: Define Variable Valency? Give examples.

Ans: “An element having more than one valency is called variable valency”

Element	Variable valency
Copper Cu	1 and 2
Mercury Hg	1 and 2
Iron Fe	2 and 3

Q16: Define Ionic Compounds? Give examples.

Ans: “Compounds that contains oppositely charged ions held together by ionic bonds are called ionic compounds”

Example: Sodium Chloride (NaCl)

Q17: Define Covalent Compounds? Give examples.

Ans: “Compounds formed by the sharing of electrons between different atoms are called covalent compounds”

Example: H₂O, HCl, CH₄ etc

Q18: Define Atomic Number? Give examples.

Ans: “The number of protons present in the nucleus of an atom of the element is called atomic number of element” It is represented by the symbol “Z”

Element	Atomic Number, Z
Hydrogen (H)	1
Carbon (C)	6
Nitrogen (N)	7

Oxygen (O)	8
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Q19: Define Mass Number? Give examples.

Ans: “The sum of number of protons and neutrons present in the nucleus of an atom is called mass number” It is represented by the symbol “A”

Mass Number = Number of Protons + Number of Neutrons

$$A = Z + N$$

Q20: Define Ion? Give example.

Ans: “An atom or group of atoms having a charge on it is called Ion”

Example: Na^+ , H^+ , NH_4^+ etc

Q21: Define Cation? Give example.

Ans: “An atom or group of atoms having positive charge on it is called Cation”

Example: K^+ and Mg^{2+}

Q13: Define Anion? Give example.

Ans: “An atom or group of atoms having negative charge on it is called Anion”

Example: Cl^- and Br^-

Q14: Define Chemical Species? Give example.

Ans: “The atom molecule, ion, molecular ion and free radical are called chemical species”

Example: Na^+ , H_2O and Cl^-

Q15: Define Monoatomic Ion? Give example.

Ans: “An ion having a single atom is called monoatomic ion”

Example: Hydrogen Ion (H^+)

Q16: Define Polyatomic Ion? Give example.

Ans: “An ion having two or more atoms is called a polyatomic ion”

Example: Ammonium ion (NH_4^+)

Q17: Differentiate between Atom & Ion?

Ans:

Atom	Ion
It is the smallest particle of an element.	It is the smallest unit of an ionic compound.
It is electrically neutral.	It carries an electric charge, positive or negative.

Q18: Define Free Radical? Give example.

Ans: “An atom or group of atoms having one unpaired electron is called Free Radical”

Example: Cl

Q19: Define Monoatomic Molecules? Give example.

Ans: “A molecule consisting of only one atom of element is called Monoatomic molecule”

Example: Helium (He), Neon (Ne) and Argon (Ar)

Q20: Define Diatomic Molecules? Give example.

Ans: “A molecule consisting of two atoms is called a diatomic molecule”

Example: Hydrogen (H_2), Nitrogen (N_2)

Q21: Define Triatomic Molecule? Give example.

Ans: “A molecule consisting of three atoms is called a triatomic molecule”

Example: Water (H_2O), Carbon Dioxide (CO_2) and Ozone (O_3)

Q22: Define Polyatomic Molecules? Give example.

Ans: “A molecule consisting of many atoms is called a Polyatomic molecule”

Example: Methane (CH_4)

Q23: Define Homoatomic Molecules? Give example.

Ans: "A molecule of an element containing same type of atoms is called a Homoatomic Molecule"

Example: Hydrogen (H_2), Nitrogen (N_2) and Oxygen (O_2)

Q24: Define Heteroatomic Molecules? Give example.

Ans: "A molecule of a compound containing different kinds of atoms is called a Heteroatomic Molecules"

Example: Ammonia (NH_3) and Water (H_2O)

Q25: Define Gram Atomic Mass? Give example.

Ans: "The atomic mass of an element expressed in grams is called gram atomic mass"

Example: 1 gram atom of hydrogen (H) = 1 mole of Hydrogen (H) = 1.008

Q26: Define Gram Molecular Mass? Give example.

Ans: "The Molecular mass of an element expressed in grams is called gram molecular mass"

Example: 1 gram molecule of hydrogen (H_2) = 1 mole of hydrogen (H_2) = 2.016 g

Q27: Define Gram Formula Mass? Give example.

Ans: "The formula mass of an element expressed in grams is called gram formula mass"

Example: 1 gram formula of $NaCl$ = 1 mole of $NaCl$ = 58.5 g

Q28: Define Avogadro's Number? Give example.

Ans: "The number 6.02×10^{23} of particle of any kind (atoms, ions, molecules or formula units) in one mole of substance is called Avogadro's number"

Example: 6.02×10^{23} atoms of Oxygen (O) = 1 mol of O

Q29: Define Mole? Give example.

Ans: "The amount (mass) of a substance that contains 6.02×10^{23} particles (atoms, molecules or formula units) is called a mole"

Example: 1 mole of C = atomic mass of C = 12.0 g

Q30: Write two applications of Industrial Chemistry?

Ans: It is used in fertilizers, soap and textiles.

Q31: Write two applications of Nuclear Chemistry?

Ans: It is applied in medical treatment and preservation of food.

Q32: Write two applications of Biochemistry?

Ans: It is applied in the field of medicine, food science and agriculture.

Q33: Write two applications of Inorganic Chemistry?

Ans: It is applied in chemical industry such as glass, cement, ceramics and metallurgy.

Q34: Write two applications of Analytical Chemistry?

Ans: In it different techniques and instruments used for analysis are studied.

Q35: Write two applications of Organic Chemistry?

Ans: It is used in petroleum and petrochemicals industries.

Test Yourself 1.1

Q1: In which branch of chemistry behaviour of gases and liquids is studied?

Ans: Physical Chemistry

Q2: Define Biochemistry?

Ans: "The chemistry of life is called biochemistry"

Q3: Which branch of chemistry deals with preparation of paints and papers?

Ans: Industrial Chemistry

Q4: In which branch of chemistry are the metabolic processes of carbohydrates and proteins studied?

Ans: Biochemistry

Q5: Which branch of chemistry deals with energy of atoms and its uses in daily life?

Ans: Nuclear Chemistry

Q6: Which branch of chemistry deals with the structure and properties of naturally occurring molecules?

Ans: Biochemistry

Test Yourself 1.2

Q1: How can you justify that air is a homogeneous mixture?

Ans: Because it is visually uniform throughout.

Q2: Name the elements represented by the following symbols:

Hg, Au, Fe, Ni, Co, W, Sn, Na, Ba, Br, Bi, C

Ans:

Name	Symbol	Name	Symbol
Mercury	Hg	Iron	Fe
Gold	Au	Nickel	Ni
Cobalt	Co	Tungsten	W
Tin	Sn	Sodium	Na
Barium	Ba	Bromine	Br
Bismuth	Bi	Carbon	C

Q3: Name one solid, one liquid and one gaseous element present at the room temperature?

Ans: Solid Element: Aluminium, Carbon

Liquid Element: Bromine, Mercury

Gaseous Element: Oxygen, Nitrogen

Q4: What elements do the following compounds contain?

Sugar, Common salt, Lime water and Chalk

Ans:

Sugar	$C_{12}H_{22}O_{11}$
Common Salt	NaCl
Lime water	$Ca(OH)_2$
Chalk	$CaCO_3$

Test Yourself 1.3

Q1: Is atomic mass unit a SI unit of an atomic mass?

Ans: Atomic mass unit (amu) is not SI unit of atomic mass.

Q2: Why atomic mass of an atom is defined as relative atomic mass?

Ans: Because it is compared with the mass of an atom of carbon-12 taken as 12.00 amu.

(Important Long Questions)

1. Write down any three differences between molecule and molecular ion?
2. List five characteristics by which compounds can be distinguished from mixtures?
3. Define atomic number and mass number with example?
4. What are the difference between Atom and Ions?

Structure of Atoms***M.C.Q's*****Q: Multiple Choice Questions:**

1. Which one of the following results in the discovery of protons:

- (a) Cathode rays (c) X-rays
(b) **Canal rays** (d) alpha rays

2. Which one of the following is the most penetrating.

- (a) Protons (c) **neutrons**
(b) electrons (d) alpha particles

3. The concept of orbit was used by:

- (a) J.J Thomson (c) **Bohr**
(b) Rutherford (d) Planck

4. Which one of the following shell consists of three subshells.

- (a) O shell (c) L shell
(b) N shell (d) **M shell**

5. Which radioisotope is used for the diagnosis of tumor in the body?

- (a) Cobalt-60 (c) strontium-90
(b) **Iodine-131** (d) phosphorus-32

6. When U-235 breaks up, it produces:

- (a) electrons (c) protons
(b) **neutrons** (d) nothing

7. The p subshell has:

- (a) One orbital (c) **three orbital**
(b) Two orbital (d) four orbital

8. Deuterium is used to make:

- (a) Light water (c) Soft water
(b) **Heavy water** (d) Hard water

9. The molar mass of H_2SO_4 is:

- (a) 96.9 % (c) 99.7 %
(b) 97.6 % (d) **98.9 %**

10. Who discovered the proton?

- (a) **Goldstein** (c) J.J Thomson
(b) Niels Bohr (d) Rutherford

CHAPTER 2

Structure Of Atoms

(Exercise Short Questions)

Q1: What is the Nature of Charge on Cathode Rays?

Ans: The charge on cathode rays is negative charge.

Q2: Give five Characteristics of Cathode Rays?

Ans:

- | |
|--|
| (i) These rays are travel in a straight line perpendicular to the cathode surface. |
| (ii) Light is produced when these rays hit the walls of discharge tube. |
| (iii) They raise temperature of the body on which they fall. |
| (iv) They can cast a sharp shadow of an opaque object if placed in their path. |
| (v) They are deflected towards positive plate in an electric field showing that they are negatively charged. |

Q3: The Atomic symbol of a Phosphorus ion is given as: $^{31}_{15}\text{P}^{3-}$

(a) How many Protons, Electrons and Neutrons are there in the ion?

Ans: Protons=15, Electrons=15 and Neutrons=16

(b) What is name of the ion?

Ans: Phosphorus

(c) Draw the electronic configuration of the ion?

Ans: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$

(d) Name the noble gas?

Ans: Argon

Q4: Difference Between Shell and Sub shell with Example of each?

Ans:

SHELL	SUBSHELL
The electrons revolves around the nucleus in different energy level or shells according to their respective energies.	The electron revolves around the shells according to their respective energies.
Example: K, L Shells	Example: s, p, d, f are sub shells

Q5: An element has an Atomic number 17. How many electrons are present in K, L and M shells of the atom?

Ans: K Shell has 2 Electrons

L Shell has 8 Electrons

M Shell has 7 Electrons

Q6: Write down the electronic configuration of Al^{3+} . How many electrons are present in its outermost shell?

Ans: $\text{Al} = 1s^2, 2s^2, 3p^6, 3s^2, 3p^1$ $^{26}\text{Al}_{13}$
3 electrons are present in outermost shell.

Q7: Mg has electronic configuration 2, 8, 2.

(a) How many electrons are present in outermost shell?

Ans: 2 electrons are present in outermost shell.

(b) In which substance of the outermost shell electrons are present?

Ans: $3s^2$ Sub shell

(c) Why Mg tends to lose electrons?

Ans: To achieve stability.

Q8: What will be the nature of charge on atom when it losses and gains an electron?

Ans: When atom losses an electron it has positive charge. When an atom gains an electron it has negative charge.

Q9: For what purpose is U-235 used?

Ans: U-235 used for electric power generation

Q10: A patient has goiter. How will it be detected?

Ans: When a patient has goiter it will be detected with Iodine 131.

Q11: Give three properties of positive rays?

Ans:

(i) These rays are made up of positively charged particles.

(ii) The mass charge of these particles depends upon the nature of gas.

(iii) These rays produce different types of positive rays.

Q12: What are the defects of Rutherford's atomic model?

Ans:

(i) According to classical theory of radiation electrons being the charged particles should release or emit energy continuously and they should ultimately fall into the nucleus.

(ii) If the electrons emit energy continuously and they should from a continuous spectrum but in fact, line spectrum was observed.

Q13: As long as electron remains in an orbit, it does not emit or absorb energy. What does it emit or absorb energy?

Ans: The energy is emitted or absorbed only when an electron jumps from one orbit to another.

Important Extra Short Questions

Q1: Define Proton?

Ans: In 1886, Goldstein discovered positive charged particles called **Protons**.

Q2: Define Electrons?

Ans: In 1897, J.J Thomson found in an atom negatively charged particles called **Electrons**.

Q3: Define Rutherford's Atomic Theory?

Ans: This atomic model was based on the classical theory.

Q4: Define Bohr's Atomic Theory?

Ans: This atomic model was based upon Max Plank's quantum theory of radiation.

Q5: Define Electronic Configuration?

Ans: "The distribution of electrons in various subshells is called electronic configuration"

Q6: Define Isotopes?

Ans: "Two or more atoms of an element having the same atomic number but different mass numbers are called isotopes"

Q7: Define Radioactive isotopes?

Ans: "Isotopes which are produced artificially are called radioactive isotopes"

Q8: What is Thomson's Plum Pudding Theory?

Ans: "An atom occupies a spherical shape in which the positive charge and the mass were uniformly distributed and electrons are embedded in this positively charged sphere to minimize electrostatic repulsions"

Test Yourself 2.1

Q1: Do you now any element having no neutrons in its atoms?

Ans: The H-atom has no neutron.

Q2: Who discovered an electron ,a proton and a neutron?

Ans: J.J Thomson discovered electron .

Goldstein discovered proton .

Chadwick discovered neutron.

Q3: How does electron differ from neutron?

Ans: Electron is a negative particle .Its mass is 9.1×10^{-31} kg or 0.000548amu.

Neutron is a neutral particle. Its mass is 1.674×10^{-27} kg or 1.0087amu.

Neutron is heavier than an electron.

Test Yourself 2.2

Q1: How was it proved that the whole mass of an atom is located at its Centre?

Ans: This indicates that whole of the positive charge and most of the mass of an atom is located at its Centre.

Q2: How was it shown that atomic nuclei are positively charged?

Ans: The deflection of α -particles indicates that atomic nuclei are positively charged.

Q3: Name the particles which determine the mass of an atom?

Ans: The particles electrons, proton and neutron determine the mass of an atom.

Q4: What is the classical theory of radiation?How does it differ from quantum theory?

Ans: According to **classical theory of radiation**, a hot **vibrating** body radiates energy all time it is vibrating.

According to **quantum theory of radiation**, a hot **vibrating** body does not emit or absorb energy continuously but does so discontinuously in the form of small energy packets or bundles known as quantum or photons in case of light energy.

Test Yourself 2.3

Q1: What is the maximum number of electrons that can be accommodated in 'p' subshell?

Ans: 'p' subshell can accommodate maximum number of 6 electrons.

Q2: How many subshells are there in second shell?

Ans: In second shell there are two subshell, s and p.

Q3: Why does an electron first fill 2p orbital and then 3s orbital?

Ans: Because 2p orbital is of lower energy than 3s orbital.

Q4: How many electrons can be accommodated in M shell?

Ans: M shell can be accommodating 18 electrons.

Q5: What is the electronic configuration of a hydrogen atom?

Ans: The electronic configuration of a H-atom is $1s^1$

Q6: What is the atomic number of phosphorus?

Ans: Atomic number of P = 15

Q7: What is maximum capacity of a shell?

Ans: Maximum number of electrons in any shell can be calculated by the formula $= 2n^2$

Test Yourself 2.4

Q1: Why do the isotopes of an element have different atomic masses?

Ans: Because they have different number of neutrons.

Q2: Which of the isotopes of hydrogen contains greater number of neutrons?

Ans: Tritium has two neutrons.

Q3: How is the goiter in thyroid gland detected?

Ans: Iodine-131 is used for diagnosis of goiter in thyroid gland.

Q4: When U-235 breaks up, it produces a large amount of energy.

Ans: Breaking up of U-235 is used to convert water into steam in boilers.

Q5: How many neutrons are produced in the fission reaction of U-235?

Ans: Three neutrons are produced in the fission reaction of U-235.

Q6: U-235 fission produces two atoms of which elements?

Ans: The fission of U-235 produces one atom of Ba-139 and one atom of Kr-94.

(Important Long Questions)

1. How are cathode rays produced? What are its five major characteristics?
2. How was it proved that electrons are fundamental particles of an atom?
3. How Rutherford discovered that atom has a nucleus located at the centre of the atom?
4. What is an isotope? Describe the isotopes of hydrogen with diagram.
5. Write down important postulates of Bohr's atomic model?
6. How neutron was discovered? Write its three properties.
7. Give the applications of isotopes in the field of radiotherapy and medicines?
8. What do you mean by electronic configuration? What are basic requirements while writing electronic configuration of an element.

Periodic Table and Periodicity of Properties***M.C.Q's*****Q: Multiple Choice Questions:**

1. The atomic radii of the elements in the periodic table:

- (a) Increase from left to right in a period
- (b) Increase from top to bottom in a group**
- (c) Do not change from left to right in a period
- (d) Decrease from top to bottom in a group

2. The amount of energy given out when an electron is added to an atom is called:

- (a) Lattice energy
- (b) electronegativity
- (c) ionization energy
- (d) electron affinity**

3. Mendeleev periodic table was based upon the:

- (a) Electronic configuration
- (b) Atomic number
- (c) **atomic mass**
- (d) completion of a subshell

4. Long form of periodic table is constructed on the basis of:

- (a) Mendeleev postulate
- (b) Mass number
- (c) Atomic mass
- (d) Atomic number**

5. 4th and 5th period of the long form of periodic table are called:

- (a) Short periods
- (b) Long periods**
- (c) normal periods
- (d) very long periods

6. Which one of the following halogen has lowest electronegativity?

- (a) fluorine
- (b) bromine
- (c) chlorine
- (d) iodine**

7. Along the period, which one of the following decreases:

- (a) Atomic radius**
- (b) electronegativity
- (c) electron affinity
- (d) ionization energy

8. Transition elements are:

- (a) All gases
- (b) All metals**
- (c) all non-metals
- (d) all metalloids

9. Mark the incorrect statement about ionization energy:

- (a) It is measured in kJmol^{-1}
- (b) It decreases in a period**
- (c) it is absorption of energy
- (d) it decreases in a group

10. Point out the incorrect statement about electron affinity:

- (a) It is measured in kJmol^{-1}
- (b) It decreases in a period**
- (c) it involves release of energy
- (d) it decreases in a group

CHAPTER 3

Periodic Table & Periodicity of Properties

(Exercise Short Questions)

Q1: Why noble gasses are not reactive?

Ans: Noble gases are not reactive because their order of outermost shell is complete filled by electrons.

Q2: Why cesium (at. no 55) requires little energy to release its one electron present in the outermost shell?

Ans: Because the force of attraction between the nucleus and the outermost electron decreases due to increase in atomic size.

Q3: How is periodicity of properties dependent upon number of proton in an atom?

Ans: They vary when we move from left to right across the period or from top to bottom in any group.

Q4: Why shielding effect of electrons makes cation formation easy?

Ans: The greater the shielding effect of electrons, the lesser will be the valence electron nucleus attraction. As the force of attraction between the nucleus and the outer electron decreases, the removal of electron becomes more easily or with less energy.

Q5: What is the difference between Mendeleev's periodic law and Modern periodic law?

Ans:

Mendeleev's Law	Modern Law
The properties of elements are the periodic function of their atomic <u>Masses</u> .	The properties of elements are the periodic function of their atomic <u>Number</u> .

Q6: What do you mean by Groups and Periods in a periodic table?

Ans:

Groups	Periods
The vertical columns of elements in a periodic table.	The horizontal rows of elements in a periodic table.
There are 18 groups in the long form of the periodic table.	There are 7 periods in the long form of the periodic table.

Q7: Why and how elements arranged in 4th period?

Ans: We arranged elements in the periods on the basis of their properties. And elements are arranged in 4th period according to their atomic number.

Q8: Why the size of atom does not decrease regularly in a period?

Ans: The atomic size does not decrease regularly in a period due to poor shielding effect. This effect is quite remarkable in the transition elements of longer periods in which 'd' and 'f' sub shells are involved.

Q9: Give the trend of ionization energy in a period?

Ans: Ionization energy increases from left to right in a period:-

Reason:-

(a) Increase of Nuclear Charge

(b) Decrease in Atomic size

Important Extra Short Questions

Q1: What do you know about triads?

Ans: "A group of three elements with similar chemical properties is called a triad"

Q2: What do you know about Dobernier's Triads?

Ans: "In a triad of similar elements, the atomic mass of the middle element is equal to the average of the atomic masses of first and third element"

Q3: Define Normal Elements?

Ans: "All s-block and p-block elements excluding noble gases are called Normal elements"

Q4: Define Transition Elements?

Ans: "Elements in which 'd' subshell is in the process of completion are called transition elements"

Q5: Define Noble Gases?

Ans: "The gaseous elements of group 18 or zero group are called Noble gases"

Q6: What is meant by periodicity of properties?

Ans: "The repetition of similar properties after regular intervals in the periodic table is called periodicity of properties"

Q7: Define Atomic Radius?

Ans: "The half of the distance between the nuclei of the two bonded atoms is called Atomic radius"

Q8: Why Atomic radius decreases from left to right in a period?

Ans: Because with the increase of atomic number, the effective nuclear charge increases.

Q9: Why Atomic radius increases from top to bottom in a group?

Ans: Because the shielding effect increases which decreases the effective nuclear charge.

Q10: Define Shielding effect?

Ans: "The effect of decrease in force of attraction between the nucleus and the valence electrons due to increasing number of inner shell electrons between is called Shielding effect"

Q11: Why Shielding effect does not change in a period?

Ans: Because in a period the number of inner-shells remains the same.

Q12: Why Shielding effect increases from top to bottom in a group?

Ans: Because in a group the number of inner-shells increases.

Q13: Define Ionization energy?

Ans: "The amount of energy required to remove the most loosely electron from the valence shell of an isolated gaseous atom is called Ionization energy"

Q14: Why Ionization energy decreases from top to bottom in a group?

Ans: Because the size of atoms increases and shielding effect increases.

Q15: Why Ionization energy increases from left to right in a period?

Ans: Because the size of atoms decreases and shielding effect decreases.

Q16: Define Electron Affinity?

Ans: "The amount of energy released when an electron is added in the outermost shell of an isolated neutral gaseous atom to form a uninegative ion is called Electron Affinity"

Q17: Why Electron affinity increases from left to right in a period?

Ans: Because nuclear charge increases and atomic size decreases in a period.

Q18: Why Electron affinity decreases from top to bottom in a group?

Ans: Because the size of atoms increases down the group.

Q19: Define Electronegativity?

Ans: "The ability of an atom to attract the shared pair of electrons towards itself in a molecule is called electronegativity"

Q20: Why Electronegativity increases from left to right in a period?

Ans: Because nuclear charge increases and atomic sizes decrease.

Q21: Why Electronegativity decreases from top to bottom in a group?

Ans: Because atomic size increases down the group.

Test Yourself 3.1

Q1: What was the contribution of Dobereiner towards classification of elements?

Ans: According to him, elements can be arranged to groups of three, in which the atomic mass of the middle element is the average of the first and third element.

Q2: How Newland arranged the elements?

Ans: Newland arranged the elements in the order of their increasing atomic masses.

Q3: Who introduced the name Periodic Table?

Ans: The name 'Periodic Table' was first introduced by Mendeleev.

Q4: Why the improvement in Mendeleev's periodic table was made?

Ans: Because this table was failed to explain the position of isotopes and wrong order of atomic masses of some elements.

Q5: Why and how elements are arranged in a period?

Ans: Elements are arranged in a period according to increasing atomic number from left to right.

Test Yourself 3.2

Q1: How the properties of elements repeat after regular intervals?

Ans: If the elements are arranged in increasing order of their atomic numbers from left to right in a horizontal row, their properties repeat after regular intervals.

Q2: How many elements are in first period and what are their names?

Ans: In the first period there are only two elements, hydrogen (H) and helium (He)

Q3: How many elements are placed in 4th period?

Ans: In the 4th period, 18 elements are placed.

Q4: From which element lanthanide series starts?

Ans: Lanthanide series starts from the element cerium (Ce)

Q5: From which period lanthanide series starts?

Ans: Lanthanide starts from 6th period.

Q6: How many elements are in 3rd period?

Ans: In the 3rd period there are 8 elements.

Q7: How many periods are considered normal periods?

Ans: The two periods, 2nd & 3rd periods are considered as normal periods.

Q8: What is the reason of arranging elements in a group?

Ans: Because they have similar electronic configuration in their valence shells.

Q9: How many members are in group 17, is there any liquid, what is its name?

Ans: There are five members in group 17. There is one liquid element.
Its name is bromine (Br).

Test Yourself 3.3

Q1: Why the size of atoms decreases in a period?

Ans: Because with the increases of atomic number, the effective nuclear charge increase.

Q2: Why second ionization energy is higher than the first one?

Ans: Because after the removal of an electron from the atom, the number of electrons decreases while the nuclear charge remains the same.

Q3: Why does the bigger size atom have more shielding effect?

Ans: The bigger size atoms have greater number of inner shells electrons in between the nucleus and valence electrons.

Q4: Which elements have the highest electronegativity?

Ans: Fluorine has the highest electronegativity (4.0)

(Important Long Questions)

1. Describe the trends of electronegativity in a period and in a group?
2. Discuss the important features of modern periodic table?
3. Why and how elements are arranged in a periodic table?
4. What is ionization energy? Describe its trends in the periodic table?
5. Define electron affinity, why it increases in a period and decreases in a group in the periodic table?
6. Define Atomic Radius and describe its trend in the periodic table?
7. Justify the statement, bigger size atoms have more shielding effect thus low ionization energy?
8. Show why in a period the size of an atom decreases if one moves from left to right?

Structure of Molecules***M.C.Q's*****Q: Multiple Choice Questions:**

1. Atoms react with each other because:

- (a) They are attracted to each other (c) **they want to attain stability**
(b) They are short of electrons (d) they want to disperse

2. An atom having six electrons in its valence shell will achieve noble gas electronic configuration:

- (a) Gaining one electron (c) losing all electron
(b) **Gaining two electron** (d) losing two electron

3. Considering the electronic configuration of atoms which atom with the given atomic number will be the most stable one?

- (a) 6 (b) 8 (c) **10** (d) 12

4. Octet rule is:

- (a) Description of eight electrons
(b) Picture of electronic configuration
(c) Pattern of electronic configuration
(d) **Attaining of eight electrons**

5. Transfer of electrons between atoms results in:

- (a) Metallic bonding (c) **ionic bonding**
(b) Covalent bonding (d) coordinate covalent bonding

6. When an electronegative element combines with an electropositive element the type of bonding is:

- (a) covalent (c) **ionic**
(b) polar covalent (d) coordinate covalent

7. A bond formed between two non-metals is expected to be:

- (a) **covalent** (c) ionic
(b) coordinate covalent (d) coordinate covalent bonding

8. A bond pair in covalent molecules usually has:

- (a) One electron (c) **two electron**
(b) Three electron (d) four electron

9. Which of the following compounds is not directional in its bonding?

- (a) CH₄ (b) **KBr** (c) CO₂ (d) H₂O

10. Ice floats on water because:

- (a) Ice is denser than water (c) **water is denser than ice**
(b) Ice is crystalline in nature (d) water molecules move randomly

11. Covalent bond involves the

- (a) Donation of electrons (c) acceptance of electrons
(b) **Sharing of electrons** (d) repulsion of electrons

12. How many covalent bonds does C₂H₂ molecule have?

- (a) two (b) three (c) four (d) **five**

13. How many electrons does a triple covalent bond involve?

- (a) eight (b) **six** (c) four (d) only three

CHAPTER 4

Structure of Molecules

(Exercise Short Questions)

Q1: Why do atoms react?

Ans: Atoms react with each other to complete their last shells to get stability.

Q2: Why is the bond between an electropositive and an electronegative atom ionic in nature?

Ans: The bond between an electropositive atom loses the electrons to form ionic (+) ions and electropositive atom gain electrons to give (-) ions.

Q3: Ionic compounds form solids. Justify?

Ans: Ionic compounds form solids because ionic compound, have strong ionic bonds, combine ions to give solids.

Q4: More electronegative elements can form bonds between themselves. Justify?

Ans: Electronegative elements have ability to get electrons because magnetic ions combine with positive ions to form ionic bond.

Q5: Metals are good conductor of electricity. Why?

Ans: Metals are good conductor of electricity due to presence of free electron.

Q6: Ionic salts conduct electricity in solution or molten form. Why?

Ans: Ionic salt conducts electricity in solution or molten form because they have free ions in solution or molten forms, and conduct electricity.

Q7: What types of covalent bonds is formed in nitrogen molecule?

Ans: Triple covalent bond is formed in nitrogen molecule.

Q8: Difference between lone pair and bond pair of electron?

Ans:

Lone Pair	Bond Pair
The pair of electron which does not contribute in bonding and available on atom.	The shared pair of electrons between two bonded atoms is called bond pair of electrons.
Example: In NH_3 atom has one pair of electron	Example: $\text{H} \bullet \times \text{H}$

Q9: Describe at least two necessary conditions for the formation of covalent bond?

Ans: A covalent bond is usually formed between two nonmetal atoms. Both atoms contribute equal number of electrons in the formation of covalent bond.

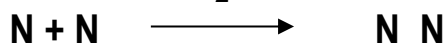
Q10: Why HCl has dipole-dipole forces of attraction?

Ans: HCl has dipole-dipole force due to the unequal sharing of electrons between two different types of atoms make one end of molecule slightly positive and other end is slightly negative.

Q11: What is a triple covalent bond, explain with an example?

Ans: The bond formed by sharing three pairs of electrons between two atoms is called triple covalent bond. It is represented by three straight lines.

Example: Formation of N_2



Q12: What is the difference Polar and Non-polar Covalent Bonds, Explain with one Example?

Ans:

Polar Covalent Bond	Non-Polar Covalent Bond
A covalent bond formed between two atoms of different elements is called a polar covalent bond.	A covalent bond formed between two atoms of the same element is called nonpolar covalent bond.
Example: $H - Cl$	Example: $H - H$

Q13: Why a covalent bond becomes Polar?

Ans: The covalent bond becomes polar due to the unequal attraction to the bounded pair of electron.

Example: $H^+ - Cl^-$

Q14: What is the relationship between Electronegativity and Polarity?

Ans: The polarity of the covalent bond depends upon the electronegativity difference between the bonded atoms. Greater the electro negativity difference more polar is the bond.

Q15: Why the metals can conduct electricity?

Ans: The metals can conduct electricity. This is because they have free mobile electrons.

Q16: Why Ice float on water?

Ans: Because ice has lower density than water. The density of ice at $0^\circ C$ (0.917 g cm^{-3}) is less than that of liquid water at $0^\circ C$ (1.00 g cm^{-3}). Hence, ice floats on water.

Q17: Give the characteristic properties ionic compounds?

Ans: Characteristics of Ionic Compounds:-

- | |
|---|
| (a) All ionic compounds are crystalline solids at room temperature. |
| (b) Ionic compounds do not conduct electricity in the solid state. |
| (c) Ionic compounds have high melting and boiling points. |

Q18: What Characteristic properties do the covalent compounds have?

Ans: Characteristics of Covalent Compounds:-

- | |
|---|
| (a) They are bad conductor of electricity. |
| (b) They are usually low melting and boiling points. |
| (c) They are stable and hard. |
| (d) They are insoluble in polar solvents and soluble in non-polar solvents. |

Important Extra Short Questions

Q1: Define Duplet Rule?

Ans: Attaining *two* electrons in the valence shell is called duplet rule.

Q2: Define Octet Rule?

Ans: Attaining *eight* electrons in the valence shell is called octet rule.

Q3: What is a Chemical Bond?

Ans: The attractive force by means of which atoms are held together in stable arrangements is called chemical bond.

Q4: Define Valence Electron?

Ans: *The electrons in the outermost shell of an atom are called valence electron.*

Q5: Define Bonding Electron?

Ans: *"The valence electrons which take part in forming chemical bonds are called bonding electron"*

Q6: Define Non-Bonding Electron?

Ans: *"The valence electrons which don not take part in forming chemical bonds are called nonbonding electron"*

Q7: How many types of chemical bond?

Ans: There are *four* types of chemical bonds.

Q8: Define Ionic Compounds?

Ans: "Compounds that are made up of positively and negatively charged ions are called ionic bond"

Q9: Define Covalent Compounds?

Ans: "Compounds that are formed by sharing of electrons between their atoms are called covalent bond"

Q10: Define Hydrogen Bonding?

Ans: "The attractive force which binds hydrogen atom of one molecule with electronegative atom of another molecule is called Hydrogen Bond"

Q11: Define Dipole-Dipole Interactions?

Ans: "The attraction between oppositely charged ends of polar molecules are called dipole-dipole interactions"

Q12: Define Intermolecular forces?

Ans: "The weak attractive forces between individual molecules of a substance are called Intermolecular forces"

Q13: How many types of Covalent bonds?

Ans: There are three types of covalent bonds.

Q14: Define Ionic Bonds?

Ans: "The electrostatic attraction between positive and negative ions is called ionic bonds"

Q15: Define Covalent Bond?

Ans: "The attraction between two atoms due to mutual sharing of electrons is called covalent bonds"

Q16: Define Coordinate covalent bond?

Ans: "A covalent bond in which the bond pair of electrons is donated by one bonded atom only is called a coordinate covalent bond"

Q17: Define Metallic Bond?

Ans: "The electrostatic force of attraction which binds positive metal ions to mobile valence electrons is called metallic bond"

Q18: Define Polar Molecule?

Ans: "A molecule in which bond particles do not cancel out each other is called a polar molecule"

Test Yourself 4.1

Q1: Why does sodium form a chemical bond with chlorine?

Ans: Both sodium and chlorine form a chemical bond in order to require 8 electrons in their outermost shell.

Q2: Why does sodium lose an electron and attains +1 charge?

Ans: Sodium loses an electron in order to acquire 8 electrons in its outermost shell.

Q3: How do atoms follow octet rule?

Ans: By losing, gaining and sharing valence electrons with other atoms.

Q4: Which electrons are involved in chemical bonding?

Ans: In chemical bonding the electrons of outermost or valence shell are involved.

Q5: Why chlorine can accept only one electron?

Ans: Chlorine has 7 electrons in its valence shell. It can accept only one electron to complete its valence shell.

Test Yourself 4.2

Q1: Give the electronic configuration of carbon atom.

Ans: Electronic configuration of carbon = $1s^2, 2s^2, 2p^2$

Q2: What type of elements have tendency of sharing of electrons?

Ans: Nonmetals have tendency of sharing of electrons.

Q3: If repulsive forces dominate to attractive forces will a covalent bond is formed?

Ans: If repulsive forces dominate to attractive forces covalent bond will not be formed.

Q4: Why is the BF_3 electron deficient?

Ans: In the formation of boron trifluoride, BF_3 molecule, three valence electrons of boron are shared with three electrons of F atoms, one each from three F atoms.

Q5: What type of electron pairs makes a molecule good donor?

Ans: A molecule becomes good electron pair donor when it has at least one lone pair of electrons on an atom.

Q6: Why have water polar covalent bonds?

Ans: Water has polar covalent bonds because there is difference of electronegativity between H and O atoms.

Test Yourself 4.3

Q1: What type of elements form metallic bonds?

Ans: Metals form metallic bonds.

Q2: Why is the hold of nucleus over the outermost electrons in metal weak?

Ans: This is because outer or valence electrons move freely in metals.

Q3: Why the electrons move freely in metals?

Ans: This is because the valence electrons are loosely held by the nucleus of atom.

Q4: Which types of electrons are responsible for holdings the atoms together in metals?

Ans: The metal atoms are held together by free mobile valence electrons which form an electron sea or electron pool.

Q5: Why a dipole develops in a molecule?

Ans: A dipole develops in a molecule due to electronegativity difference between the two bonded atoms.

Q6: What types of attractive forces exist between HCl molecules?

Ans: Dipole dipole attractive forces exist between HCl molecules.

(Important Long Questions)

1. What is an ionic bond? Discuss the formation of ionic bond between sodium and chlorine atoms?
2. Explain the types of covalent bonds with at least one example of each type?
3. How a coordinate covalent bond is formed? Explain with examples.
4. What is metallic bond? Explain the metallic bonding with the help of a diagram.
5. Define hydrogen bonding. Explain that how these forces affect the physical properties of compounds?
6. What are intermolecular forces? Compare these forces with chemical bond forces with reference to HCl molecule?
7. What is octet rule? Why do atoms always struggle to attain the nearest noble gas electronic configuration?
8. What is chemical bond and why do atoms form a chemical bond?
9. Explain polar and non-polar covalent bonds with examples?

Physical States of Matter***M.C.Q's*****Q: Multiple Choice Questions:**

1. How many times are the liquids denser than gases?

- (a) 100 times (c) **1000 times**
(b) 10,000 times (d) 100,000 times

2. Gases are the lightest form of matter and their densities are expressed in terms of:

- (a) mg cm^{-3} (c) **g dm^{-3}**
(b) g cm^{-3} (d) kg dm^{-3}

3. Which one of the following coexists in dynamic equilibrium point?

- (a) Gas and solid (c) liquid and gas
(b) **Liquid and solid** (d) all of these

4. Which one of the following motions is possessed by solid particles?

- (a) Rotational motions (c) **vibrational motions**
(b) Translational motions (d) both translational and vibrational motions

5. Which one of the following is not amorphous?

- (a) Rubber (b) plastic (c) glass (d) **glucose**

6. One atmospheric pressure is equal to how many Pascals:

- (a) **101325** (c) 106075
(b) 10325 (d) 10523

7. In the evaporation process, liquid molecules which leave the surface of the liquid have:

- (a) Very low energy (c) moderate energy
(b) **Very high energy** (d) none of these

8. Which one of the following gas diffuses fastest?

- (a) **Hydrogen** (c) helium
(b) Fluorine (d) chlorine

9. Which one of the following does not affect the boiling point?

- (a) Intermolecular forces (c) external pressure
(b) Nature of liquid (d) **initial temperature of liquid**

10. Density of a gas increases, when its:

- (a) Temperature is increased (c) **pressure is increased**
(b) Volume is kept constant (d) none of these

11. The vapour pressure of a liquid increases with the:

- (a) Increase of pressure
(b) **Increase of temperature**
(c) Increase of intermolecular forces
(d) Increase of polarity of molecules

CHAPTER 5

Physical States Of Matter

(Exercise Short Questions)

Q1: What is Diffusion, explain with an example?

Ans: "The spontaneous flow of molecules from a region of higher concentration to a region of lower concentration is called Diffusion."

Example: A lighter gas H_2 (Molecular mass of 2 g mol^{-1}) will diffuse faster than O_2 (Molecular mass of 32 g mol^{-1})

Q2: Define Standard Atmospheric Pressure. What are its units? How it is related to Pascal?

Ans: "The pressure exerted by the atmosphere that will support a column of mercury 760mm in height at sea level is called Standard Atmospheric Pressure."

$$1 \text{ atm} = 760 \text{ mm Hg} = 760 \text{ torr} = 101325 \text{ Nm}^{-2} = 101325 \text{ Pa}$$

1 atm is called standard pressure

Q3: Why are the densities of gases lower than that of liquids?

Ans: In gases, the intermolecular attractive forces are very weak. There are large empty spaces between gas molecules. In Liquids, the intermolecular attractive forces are strong. Liquid molecules are closely packed. Hence, densities of gases are lower than that of liquids.

Q4: What do you mean by evaporation how it is affected by surface area?

Ans: "The spontaneous change of a liquid into its vapours is called evaporation."

If surface area is increased then more molecules are able to escape and evaporation occurs more quickly. Hence, greater is surface area, greater is evaporation.

Q5: Define the term allotropy with examples?

Ans: "The existence of an element in different forms in the same physical state is called allotropy."

Example: Oxygen has two allotropes Oxygen (O_2) and Ozone (O_3)

Q6: In which form sulphur exists at 100 C?

Ans: At 100 C, Sulphur exists in monoclinic form.

Q7: What is the relationship between evaporation and boiling point of a liquid?

Ans: The boiling point of a liquid is constant at a given pressure. At the boiling point, addition of heat to a liquid increases the kinetic energy of liquid molecules. As a result evaporation increases. It does not change the temperature of the liquid consequently, the boiling remains constant.

Important Extra Short Questions

Q1: Define Matter?

Ans: "Anything that has mass and occupies space is called matter"

Q2: How many matters exist in physical states?

Ans: Matter exists in three physical states.

Q3: Define Solid?

Ans: A form of matter that has a definite shape and definite volume is called Solid.

Q4: Define Liquid?

Ans: A form of matter that has indefinite shape but a definite volume is called a Liquid.

Q5: Define Gas?

Ans: A form of matter that does not have definite shape and volume is called gas.

Q6: Define Plasma?

Ans: A high temperature ionized gas mixture consisting of nearly equal number of electrons and positive ions is called plasma.

Q7: Define Boyle's Law?

Ans: The volume of a given mass of gas is inversely proportional to its pressure provided the temperature remains constant.

Q8: Define Charle's Law?

Ans: The volume of a given mass of gas is directly proportional to the absolute temperature provided the pressure is kept constant.

Q9: Define Effusion?

Ans: The escape of gas molecules under pressure through a tiny hole into a space with lesser pressure is called Effusion.

Q10: Define Absolute Temperature Scale?

Ans: A scale of temperature that starts from zero Kelvin or -273.15°C is called absolute temperature scale.

Q11: Define Vapour Pressure?

Ans: The pressure exerted by the vapours of a liquid at equilibrium with the liquid at a particular temperature is called vapour pressure of a liquid.

Q12: Define Boiling Point?

Ans: The temperature at which the vapour pressure of a liquid becomes equal to the atmospheric pressure is called boiling point of a liquid.

Q13: Define Density?

Ans: Density is mass per unit volume.

Q14: How many different types of solids?

Ans: There are two types of solids.

Q15: Define Amorphous Solid?

Ans: Particles are not arranged in a regular, repeating pattern is called Amorphous Solid.

Q16: Define Crystalline Solid?

Ans: Particles are arranged in a definite, three-dimensional pattern.

Q17: Define Transition Temperature?

Ans: The temperature at which one allotrope changes into another is called transition temperature.

Test Yourself 5.1

Q1: Why the rate of diffusion of gases is rapid that of liquid?

Ans: Because the distance between gas molecules is large as compared to liquid molecules.

Q2: Why the gases are compressible?

Ans: Because there are large empty spaces between their molecules.

Q3: What do you mean by pascal?

Ans: Pascal is a SI unit of pressure. One pascal is equal to one newton per square meter.

Q4: Why does the density of a gas increase on cooling?

Ans: Because their volume decreases.

Test Yourself 5.2

Q1: Is the Boyle's law applicable to liquids?

Ans: Boyle's law is not applicable to liquids.

Q2: Is the Boyle's law valid at very high temperature?

Ans: Because temperature is kept constant in Boyle's law.

Test Yourself 5.3

Q1: Which parameters are kept constant in Charles law?

Ans: In Charles law pressure and mass of gas are kept constant.

Q2: Why volume of gas decreases with increase of pressure?

Ans: The volume of a gas decreases with increase of pressure.

Q3: Does Kelvin scale show a negative temperature?

Ans: Kelvin scale does not show a negative temperature.

Q4: When a gas is allowed to expand, what will be its effect on its temperature?

Ans: When a gas is allowed to expand its temperature will also increase.

Q5: Can you cool a gas by increasing its volume?

Ans: No. A gas cannot be cooled by increasing its volume.

Test Yourself 5.4

Q1: Why does evaporation increase with increase of temperature?

Ans: Because kinetic energy of the molecules increases due to which they overcome the internal molecular forces and evaporate rapidly.

Q2: Why is vapour pressure higher at high temperature?

Ans: Because at high temperature the kinetic energy of the molecules increases enough to enable them to vaporize and exerts pressure.

Q3: Why is the boiling point of water higher than that of alcohol?

Ans: Because intermolecular attractive forces in water are stronger than alcohol.

Q4: Why are the rates of diffusion in liquids slower than that of gases?

Ans: This is because in liquids the molecules are relatively more closely packed.

Q5: Why does rate of diffusion increase with increase of temperature?

Ans: This is because on increasing temperature the intermolecular forces become weaker due to which the rate of diffusion increase.

Q6: Why are the liquids mobile?

Ans: This is because liquid molecules possess high kinetic energy. The positions of liquid molecules are not fixed.

Test Yourself 5.5

Q1: Which form of Sulphur exists at room temperature?

Ans: At room temperature, rhombic form of Sulphur exists.

Q2: Why is white tin available at room temperature?

Ans: White tin is available at room temperature because it is stable above 13.2°C.

Q3: Why is the melting point of a solid considered its 'identification' characteristic?

Ans: This is because a pure solid has a sharp (definite) melting point. It can be identified from its definite melting point.

Q4: Why amorphous solids do not have sharp melting points while crystalline solids do have?

Ans: This is because in amorphous solids particles are not regularly arranged. Crystalline solids particles are arranged in a definite three dimensional pattern.

Q5: Which is lighter one aluminium or gold?

Ans: This is because the density of aluminium is 2.7 gcm^{-3} while that of gold is 19.3 gcm^{-3} .

Q6: Write the molecular formula of a Sulphur molecule.

Ans: The molecular formula of Sulphur molecule is S_8 .

Q7: Which allotropic form of carbon is stable at room temperature (25°).

Ans: At room temperature (25°), graphite is more stable form of carbon.

Q8: State whether allotropy is shown by elements or compounds or both?

Ans: Allotropy is shown by elements only.

(Important Long Questions)

1. Define Boyle's Law and verify it with an example?
2. Define and explain Charles's law of gases?
3. Define Boiling point and also explain, how it is affected by different factors.
4. Difference between crystalline and amorphous solids?
5. Describe the factors which influence the diffusion of liquids?

SolutionsM.C.Q's**Q: Multiple Choice Questions:**

1. Mist is an example of solution:

- (a) **Liquid in gas** (b) Solid in gas (c) gas in liquid (d) gas in solid

2. Which one of the following is a liquid in solid solution?

- (a) Sugar in water (b) **butter** (c) opal (d) fog

3. Concentration is ratio of:

- (a) Solvent to solute (c) solute to solution
(b) Solvent of solution (d) **both a and b**

4. Which one of the following solutions contains more water?

- (a) 2 M (b) 1 M (c) 0.5 M (d) **0.25 M**

5. A 5 percent (w/w) sugar solution means that:

- (a) 5 g of sugar is dissolved in 90 g of water
(b) 5 g of sugar is dissolved in 100 g of water
(c) 5 g of sugar is dissolved in 105 g of water
(d) **5 g of sugar is dissolved in 95 g of water**

6. If the solute-solute forces are strong enough than those of solute-solvent forces. The solute:

- (a) Dissolves readily (c) **does not dissolve**
(b) Dissolves slowly (d) both a and b

7. Which one of the following will show negligible effect of temperature on its solubility?

- (a) KCl (b) KNO₃ (c) NaNO₃ (d) **NaCl**

8. Which one of the following is heterogeneous mixture?

- (a) milk (b) ink (c) **milk of magnesia** (d) sugar solution

9. Tyndall effect is shown by:

- (a) Sugar solution (b) paints (c) **jelly** (d) chalk solution

10. Tyndall effect is due to:

- (a) Blockage of beam of light (c) **scattering of beam of light**
(b) Non-scattering of beam of light (d) passing through beam of light

11. If 10 cm³ of alcohol is dissolved in 100 g of water, it is called:

- (a) % w/w (b) % w/v (c) **% v/w** (d) % v/v

12. When a saturated solution is diluted it turns into:

- (a) Supersaturated solution (c) saturated solution
(b) A concentrated solution (d) **unsaturated solution**

13. Molarity is the number of moles of solute dissolved in:

- (a) 1 kg of solution (c) 100 g of solvent
(b) 1 dm³ of solvent (d) **1 dm³ of solution**

CHAPTER 6

Solutions

(Exercise Short Questions)

Q1: Why suspension and solutions do not show Tyndall effect, while colloids do?

Ans: **Suspension** does not show Tyndall effect because particles are so big that light blocked and difficult to pass.

Solutions do not show Tyndall effect because particles do not scatter light due to their small size.

Colloids show Tyndall effect because particles absorb light energy and then scatter it in all directions.

Q2: What is the reason for the difference between solutions, colloids and suspension?

Ans: The Particle Size is main difference between solutions, colloids and suspension.

Q3: Why does not the suspension form a homogeneous mixture?

Ans: Suspension does not form a homogeneous mixture because solute particles are large in size and remain un-dissolved. They form a heterogeneous mixture.

Q4: How will you test whether given solution is a colloidal solution or not?

Ans: Tyndall effect is used to test for colloidal solution. If the solution scatters the beam of light then it is a colloidal solution otherwise not.

Q5: Classify the following into True Solution and Colloidal Solution:

Blood, starch solution, Glucose solution, Tooth paste, Copper sulphate solution, Silver nitrate solution

Ans: **True Solution:** Glucose Solution, Copper sulphate Solution, Silver nitrate solution

Colloidal Solution: Toothpaste, starch solution, Blood

Q6: Why we stir paints thoroughly before using?

Ans: Paint is a heterogeneous mixture if we not stir the paint before, then the particles will settle down.

Q7: Which of the following will scatter light and why?

“Sugar solution, Soap solution and Milk of magnesia”

Ans: Only Soap solution will scatter light because it shows Tyndall effect.

Q8: What do you mean, like dissolves like? Explain with examples.

Ans: It means polar substance dissolve in solvent and non-polar substances are dissolve in non-polar solvents to make solutions.

Q9: How does nature of attractive forces of solute-solute and solvent-solvent affect the solubility?

Ans: To dissolve me substance in another substance following **three** steps are:-

(a) Solute particles must separate from each other.

(b) Solvent particles must separate to provide space for solute particles.

(c) Solute and Solvent particles must attract and mix up.

Q10: How can you explain the solute-solvent interaction to prepare a NaCl solution?

Ans: In solid NaCl, the positive Na ions and the negative Cl ions are held together by electrostatic force of attraction. Water is a polar molecule. When solid NaCl is put into water it

dissolves readily. This is because the attractive forces between the ion of NaCl and polar molecules of water are strong enough to overcome the attractive forces between Na and Cl ions in solid NaCl crystal.

Q11: Justify with an example that solubility of a salt increases with the increase in temperature?

Ans: The solubility of those substances in water will increase with the increase of temperature which absorbs heat during the process of solution.

Solvent + Solute + Heat —————> Solution

Example: KNO₃, NaNO₃, NH₄, NO₃, AgNO₃, KCl, K₂Cr₂O₇ and CaCl₂

Q12: What do you mean by volume/volume %?

Ans: "The volume in cm³ of a solute dissolved per 100 cm³ of solution is called volume/volume percent"

Mathematically:

$$V/V\% = \frac{\text{volume of solute}}{\text{volume of solution}} \times 100$$

Important Extra Short Questions

Q1: Define Solution?

Ans: "A homogeneous mixture of two or more substances is called solution"

Solute + Solvent = Solution

Q2: Define Solute?

Ans: The component of solution which is present in smaller quantity is called solute.

Q3: Define Solvent?

Ans: The component of solution which is present in larger quantity is called solvent.

Q4: Define Aqueous Solution?

Ans: A solution of a substance in water is called aqueous solution.

Q5: Define Saturated Solution?

Ans: A solution that contains a maximum amount of solute at a given temperature is called saturated solution.

Q6: Define Unsaturated Solution?

Ans: A solution which contains less dissolved solute for a given temperature than a saturated solution is called unsaturated solution.

Q7: Define Supersaturated Solution?

Ans: A solution that is more concentrated than a saturated solution is called super saturated solution.

Q8: Define Dilute Solution?

Ans: A solution that contains relatively small amount of solute is called dilute solution.

Q9: Define Concentrated Solution?

Ans: A solution that contains relatively large amount of solute is called concentrated solution.

Q10: Define Concentration of Solution?

Ans: The ratio of the amount of solute to the amount of solution.

Q11: Define Molarity (M)?

Ans: The number of moles of solute dissolved in one dm³ of solution is called molarity.

Q12: Define Molar Solution?

Ans: A solution that contains 1 mole of solute in 1 dm³ of solution is called molar solution.

Q13: Define Solubility?

Ans: The number of grams of solute dissolved in 100g of solvent to prepare a saturated solution at a particular temperature is called solubility.

Q14: Define Colloid?

Ans: A heterogeneous mixture of intermediate size particles, between the size of solution particles and suspension particles is called Colloid.

Test Yourself 6.1

Q1: Why is a solution considered mixture?

Ans: Because in the formation of solution two or more substances are mixed in no fixed proportion.

Q2: What is the major difference between a solution and mixture?

Ans: A solution exists in one place whereas a mixture exists in two or more phases.

Q3: Why are the alloys considered solutions?

Ans: Alloys are considered solutions because they exist only in one phase.

Q4: Can you comment why it is named as "Dead Sea"?

Ans: Because no one drowns in it due to heavy concentration of salts.

Test Yourself 6.3

Q1: What will happen if the solute-solute forces are stronger than those of solute-solvent forces?

Ans: A solution will not form if the solute-solute forces are stronger than those of solute-solvent forces.

Q2: When solute-solute forces are weaker than those of solute-solvent forces?

Ans: A solution will form only when solute-solute forces are weaker than those of solute-solvent forces.

Q3: Why is iodine soluble in CCl_4 and not in water?

Ans: Like dissolves like. Iodine (nonpolar solute) is soluble in CCl_4 (nonpolar solvent). Iodine (nonpolar substance) is not soluble in water (polar substance).

Q4: Why test tube becomes cold when KNO_3 is dissolved in water?

Ans: This is because during dissolution of KNO_3 in water, heat is absorbed from water and test tube.

Test Yourself 6.4

Q1: Can colloids be separated by filtration, if not why?

Ans: No because they can pass through a filter paper.

Q2: Why are the colloids quite stable?

Ans: Because in colloids particles dissolve and do not settle down for a long time.

Q3: Why does the colloid show Tyndall effect?

Ans: Because particles of colloids are big enough to scatter the beam of light.

(Important Long Questions)

1. What is saturated solution and how many it is prepared?
2. Difference between dilute and concentrated solutions with a common example?
3. What is molarity and give its formula to prepare molar solution?
4. What is general principle of solubility?
5. Give the five characteristics of colloid?
6. Give at least five characteristics of suspension?
7. Write any three factors which affect the solubility of solute?
8. Write a note on dilution of solutions?
9. Explain the solute-solvent interaction for the preparation of solution?

ElectrochemistryM.C.Q's**Q: Multiple Choice Questions:**

1. Spontaneous chemical reactions take place in:
(a) Electrolytic cell (c) **Galvanic cell**
(b) Nelson's cell (d) Down's cell
2. Formation of water from hydrogen and oxygen is:
(a) **Redox reaction** (c) Acid base reaction
(b) Neutralization (d) Decomposition
3. Which one of the following is not an electrolytic cell?
(a) Down's cell (c) **Galvanic cell**
(b) Nelson's cell (d) Both a and c
4. The oxidation number of chromium in $K_2Cr_2O_7$ is:
(a) +2 (c) +7
(b) **+6** (d) +14
5. Which one of the following is not an electrolyte?
(a) **Sugar solution** (c) Sulphuric acid solution
(b) Lime solution (d) Sodium chloride solution
6. the most common example of corrosion is:
(a) Chemical decay (c) **Rusting of iron**
(b) Rusting of aluminium (d) Rusting of tin
7. Nelson's cell is used to prepare caustic soda along with gases. Which of the following gas is produced at cathode?
(a) Cl_2 (c) **H_2**
(b) O_3 (d) O_2
8. During the formation of water from hydrogen and oxygen, which of the following does not occur?
(a) Hydrogen has oxidized (c) Oxygen has reduced
(b) Oxygen gains electrons (d) **Hydrogen behaves as oxidizing agent**
9. The formula of rust is:
(a) **$Fe_2O_3 \cdot nH_2O$** (c) Fe_2O_3
(b) $Fe(OH)_3 \cdot nH_2O$ (d) $Fe(OH)_3$
10. In the redox reaction between Zn and HCl, the oxidizing agent is:
(a) Zn (c) **H^+**
(b) Cl^- (d) H_2

CHAPTER 7

Electrochemistry

(Exercise Short Questions)

Q1: Define Oxidation in terms of electrons. Give one example.

Ans: Loss of electrons is called Oxidation.

Example: $\text{Zn}^0 \longrightarrow \text{Zn}^{+2} + 2\text{e}^-$

Q2: Define reduction in terms of loss or gain of Oxygen or Hydrogen. Give one example.

Ans: Addition of hydrogen is called reduction. Example: $\text{Cl}_2 + \text{H}_2 \longrightarrow 2\text{HCl}$

Removal of oxygen is called reduction. Example: $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$

Q3: What is the difference between Valency and Oxidation State?

Ans:

Valency	Oxidation Number
(a) The combining capacity of an element with other elements is called valency.	Oxidation Number is the apparent charged assigned to an atom of an element in a molecule or an ion.
(b) It is always a whole number	It may be whole number
(c) It can never be zero	It may be zero

Q4: Difference between Oxidizing and Reducing agents?

Ans:

Oxidizing Agent	Reducing Agents
The substance which help the oxidation to occur are called Oxidizing Agent	The substance which help the reduction to occur are called Reducing Agent
Example: Non metals	Example: CO_2 and SO_2

Q5: Differentiate between Strong and Weak electrolytes?

Ans:

Strong Electrolyte	Weak Electrolyte
An electrolyte which ionizes completely in aqueous solution is called Strong Electrolyte .	An electrolyte which does not ionize completely in aqueous solution is called Weak Electrolyte .
Examples: NaCl	Examples: CH_3COOH

Q6: How electroplating of tin on steel is carried out?

Ans: Tin is usually electroplating on steel by placing the steel into containing a solution of tin salt. The steel is connected to an electrical circuit acting as cathode while other electrode made of tin metal act as anode. When electric current pass through the circuit tin metal ions present in the solution deposit on steel.

Q7: Why steel is plated with nickel before the electroplating of chromium?

Ans: This is because chromium metal does not directly adhere to the steel surface properly. Therefore, steel is first nickel plated.

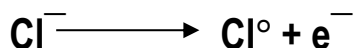
Q8: How can you explain, that following reaction is oxidation in terms of increase of oxidation number?

Ans: The increase in oxidation state is called Oxidation.



Q9: How can you prove with an example that conversion of an ion to an atom is an oxidation process?

Ans: The conversion of negative chloride Cl^- ion to chlorine Cl^0 atom is an oxidation process. This is because there is an increase in oxidation number from -1 to zero. Hence a reaction in which there is increase in oxidation number is called Oxidation.



Q10: Why does the anode carries negative charge in galvanic cell but positive charge in electrolytic cell? Justify with comments.

Ans: In **galvanic cell**, anode carries a negative charge due to deposition of electrons which are lost by the metal acting as anode.

In an **electrolyte cell**, anode carries positive charge because it is connected to positive terminal of the battery.

Q11: Where do the electrons flows from Zn electrode in Daniel's cell?

Ans: The electrons flow through the wire from the Zn electrode (Anode) to the Cu electrode (Cathode)

Q12: Why do electrodes get their names 'anode' and cathode in galvanic cell?

Ans: Because oxidation takes place at anode and reduction takes place at cathode.

Q13: What happens at the cathode in a galvanic cell?

Ans: In a galvanic cell, at the cathode reduction occurs.

Q14: Which solution is used as an electrolyte in Nelson's cell?

Ans: Aqueous solution of sodium chloride called brine is used as an electrolyte in Nelson's cell.

Q15: Name the by-products produced in Nelson's cell?

Ans: Hydrogen (H) and Chlorine (Cl)

Q16: Why galvanizing is done?

Ans: The coating of a thin layer of zinc on iron called galvanizing is done to protect iron from corrosion.

Q17: Why an iron grill is painted frequently?

Ans: In order to prevent from rusting.

Q18: Why O_2 is necessary for rusting?

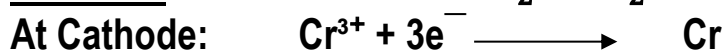
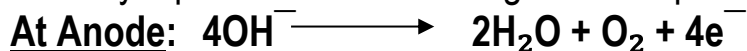
Ans: O_2 acts as a oxidizing agent and get electron from iron.

Q19: In electroplating of chromium, which salt is used as an electrolyte?

Ans: Chromium sulphate $\text{Cr}_2(\text{SO}_4)_3$

Q20: Write the redox reaction taking place during the electroplating of chromium?

Ans: Electrolyte produces the following ions in aqueous solution:-



Q21: In electroplating of silver, from where Ag^+ come and where they decay?

Ans: Ag^+ get from the anode of silver and deposit at cathode.

Q22: What is the nature of electrode used in electroplating of chromium?

Ans: Anode is made of antimonial lead.

Important Extra Short Questions

Q1: Define Electrochemistry?

Ans: The study of the process by which chemical energy is converted to electrical energy and vice versa is called electrochemistry.

Q2: Define Spontaneous Redox Reaction?

Ans: A redox reaction which takes place on its own without any external agent is called spontaneous redox reaction.

Q3: Define Nonspontaneous Reaction?

Ans: A redox reaction that takes place by passing an electric current is called nonspontaneous reaction.

Q4: Define Electrochemical Cell?

Ans: An apparatus that uses a redox reaction to produce electrical energy or uses electrical energy to cause a chemical reaction is called electrochemical cell.

Q5: Define Electrolytic Cell?

Ans: The type of electrochemical cell in which a non-spontaneous redox reaction is carried out by passing electric current is called electrolytic cell.

Q6: Define Electrolytes?

Ans: A compound which can conduct electric current in the molten state is called an electrolyte.

Q7: Define Nonelectrolytes?

Ans: A compound which does not conduct electric current is called nonelectrolyte.

Q8: Define Alloy?

Ans: A homogeneous mixture of elements with metallic properties is called an alloy.

Q9: Define Corrosion?

Ans: "The slow and continuous eating away of a metal by surrounding medium is called corrosion"

Test Yourself 7.4

Q1: Why are the strong electrolytes terms good conductors?

Ans: Strong electrolytes are good conductors because they ionize completely in water.

Q2: Do nonelectrolytes form ions in aqueous solution?

Ans: Nonelectrolytes do not form ions in aqueous solution.

Q3: What type of reaction takes place at anode in electrolytic cell?

Ans: In an electrolytic cell oxidation takes place at anode.

Q4: What type of chemical reaction takes place in electrolytic cell?

Ans: In electrolytic cell a non-spontaneous redox reaction takes place.

Q5: In the electrolysis of water, towards which terminal H^+ ions move?

Ans: In the electrolysis of water, H^+ ions move towards negative terminal.

Q6: In the electrolysis of water, where is the oxygen produced?

Ans: In the electrolysis of water, oxygen is produced at anode.

Test Yourself 7.5

Q1: Where does the sodium metal is collected in down's cell?

Ans: In Down's cell the sodium metal is collected in the cylindrical cathode.

Q2: What is the name of the by-product produced in the Down's cell?

Ans: The name of the by-product produced in the down's cell is chlorine (Cl_2)

Q3: Are anodes of down's cell and Nelson's cell made of same element?

Ans: Yes, anodes of down's cell and Nelson's cell are made of the same element.

Q4: What is the shape of cathode in Nelson's cell?

Ans: The shape of cathode in Nelson's cell is U-shaped.

Test Yourself 7.6

Q1: What happens to iron in the rusting process?

Ans: In the rusting process iron (Fe) is changed to $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$

Q2: What is the advantage of galvanizing?

Ans: That zinc protects the iron against corrosion even after the coating surface is broken.

Q3: Why tin plated iron is rusted rapidly when tin layer is broken?

Ans: The tin protects the iron only as long as its protective layer remains intact.

Q4: Name the metal which is used for galvanizing iron?

Ans: Zinc metal is used for galvanizing iron.

Test Yourself 7.7

Q1: How electroplating of Zinc is carried out?

Ans: The metal to be electroplated is cleaned in alkaline detergent type solution.

Q2: Which material is used to make cathode in electroplating?

Ans: In electroplating the article to be electroplated is made cathode.

Q3: Why is the anode made up to a metal to be deposited during electrolysis?

Ans: Because it dissolves in the electrolytic solution during electrolysis.

(Important Long Questions)

1. Describe the rules for assigning the oxidation state?
2. Discuss the electrolysis of water?
3. Explain the method of electroplating with the help of diagram?
4. Write a detailed note on Daniel Cell. Also explain its construction.
5. What is electrolytes and give its types?
6. Explain oxidation and reduction reaction with the help of diagram?
7. Describe the four differences between electrolytic cell and galvanic cell?
8. Discuss the redox reaction taking place in the rusting of iron in detail?

Chemical Reactivity***M.C.Q's*****Q: Multiple Choice Questions:**

1. Metals can form ions carrying charges:

- (a) Uni-positive (c) tri-positive
(b) Di-positive (d) **all of them**

2. Which one of the following metal burns with a brick red flame?

- (a) sodium (c) magnesium
(b) iron (d) **calcium**

3. Sodium is extremely reactive metal, but it does not react with:

- (a) hydrogen (c) sulphur
(b) **nitrogen** (d) phosphorus

4. Which one of the following is the lightest metal?

- (a) calcium (c) lithium
(b) magnesium (d) **sodium**

5. Pure alkali metals can be cut simply by knife but iron cannot because of alkali metals have:

- (a) Strong metallic bonding
(b) Non-metallic bonding
(c) **Weak metallic bonding**
(d) Moderate metallic bonding

6. Which of the following is less malleable?

- (a) sodium (c) gold
(b) **iron** (d) silver

7. Metals lose their electrons easily because:

- (a) They are electronegative (c) they have electron affinity
(b) **They are electropositive** (d) good conductors of heat

8. Which one of the following is brittle?

- (a) **sodium** (c) selenium
(b) aluminium (d) magnesium

9. Which one of the following non-metal is lustrous?

- (a) Sulphur (c) **Iodine**
(b) Phosphorus (d) Carbon

10. Non-metals are generally soft, but which one of the following is extremely hard?

- (a) Graphics (c) Iodine
(b) Phosphorus (d) **Diamond**

11. Which one of the following will not react with dilute HCl?

- (a) Sodium (b) **Carbon** (c) Potassium (d) Calcium

CHAPTER 8

Chemical Reactivity

(Exercise Short Questions)

Q1: Why reactivity of metal increase down the group?

Ans: The reactivity of metal increase downs the group due to increase in the atomic size. The ability of metals to lose electron increases down the group. Hence, their reactivity increases down the group.

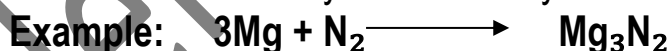
Q2: State physical properties of metals?

Ans: Almost all metals are solids:

- | |
|---|
| (a) They have high melting and boiling point. |
| (b) They possess metallic luster and can be polished. |
| (c) They have high density. |
| (d) They are hard. |

Q3: Why nitrogen forms compound with alkaline earth metals?

Ans: Nitrogen forms compound with alkaline earth metals directly because they form stable nitrides when heated with nitrogen.



Q4: Why the second ionization energy of magnesium is higher than the first one?

Ans: The second ionization energy of magnesium is higher than the first one because the removal of electron from Mg ion is difficult as the nuclear charge attracts the remaining electrons strongly. The size also decreases which contributes the increase in 2nd ionization energy.

Q5: How oxygen reacts with group 2nd A metals?

Ans: Oxygen reacts with 2nd A metal to give their oxides.



Q6: What is relationship between electropositivity and ionization energy?

Ans: The electropositivity of an element depends on the magnitude of its ionization energy. The lower is the ionization energy of an element the higher is the electropositivity of the element.

Q7: Why electropositivity decreases from left to right in a period?

Ans: Electropositive character decreases from left to right in a period due to decrease in atomic size and increase in nuclear charge.

Q8: How electropositivity depends upon size and nuclear charge of an atom?

Ans: The electropositivity depends upon the ionization energy which in turn high nuclear charge has high ionization energy. As a result, atoms having high ionization energy are less electropositive.

Q9: Why ionization energies of alkaline earth metals are higher than alkali metals?

Ans: The ionization energies of alkaline earth metals are higher than alkali metals because alkali metals are having one electron in their last shell which is required to remove while

alkaline earth metals have two electrons in their last shell which are required to remove.

Q10: Why silver and gold are least reactive?

Ans: Silver and gold are least reactive because they do not lose electrons easily.

Q11: Can pure gold be used for making ornaments? If not why

Ans: Pure gold cannot be used for making ornaments because gold is too soft to be used as such. Gold is always alloyed with copper, silver or some other metal.

Q12: Why copper is used for making electrical wires?

Ans: Copper is used for making electrical wires because it is good conductor of electricity and can be easily converted into wires.

Q13: What is the trend of variation in densities of alkali metals?

Ans: Densities of alkali metals **decrease** down the group.

Q14: Which metals is used for metal work?

Ans: **Copper** metal is used in metal work because it is easily workable.

Q15: Why magnesium is harder than sodium?

Ans: Magnesium is harder than sodium because magnesium form stronger metallic bond than sodium.

Q16: Why calcium is more electropositive than to magnesium?

Ans: Calcium is more electropositive than magnesium because calcium has greater size than magnesium and calcium has greater ability to lose the electron than magnesium.

Q17: Why ionization energy of Na is less than Mg?

Ans: Na has **larger size** and **lower nuclear charge** than Mg. Hence, ionization energy of Na is less than Mg.

Q18: Why ionization energy of Na is more than K?

Ans: Na has **smaller size** than K. Hence, Na is more ionization energy than K.

Important Extra Short Questions

Q1: Define Chemical Reactivity?

Ans: The tendency of an element to react with another element is called chemical reactivity.

Q2: Define Metals?

Ans: The elements which lose their valence electrons easily are called metal.

Q3: What are alkali metals?

Ans: Group 1 elements of the periodic table are called alkali metals.

Q4: What are alkaline earth metals?

Ans: Group 2 elements of the periodic table are called alkaline earth metals.

Q5: Define Transition Metals?

Ans: The elements in which d-subshells are in the process of filling are called transition metals.

Q6: Define Nonmetals?

Ans: The elements which gain electrons are called nonmetals.

Q7: Define Halogens?

Ans: Group 17 elements of the periodic table are called halogens.

Q8: Give two uses of gold?

Ans: 1.It is used in making coins.
2. Gold metal is used in making ornaments.

Q9: Give two uses of silver?

Ans: 1.Compounds of silver is used in photographic films and dental preparations.
2. Alloys of silver with copper are widely used in making coins.

Q10: Give two uses of magnesium?

Ans: 1.It is used as anode for prevention of corrosion.
2. It is used in the manufacture of light alloys.

Q11: Give two uses of sodium?

Ans: 1.It is used in sodium vapour lamps to produce yellow light.
2. It is used as a reducing agent in the extraction of Tanium (Ti) metal.

Q12: Give two uses of calcium?

Ans: 1.It is used for removing Sulphur from petroleum.
2. It is used as a reducing agent in the production of uranium (U).

Test Yourself 8.1

Q1: What type of elements are metals?

Ans: Metals are electropositive elements.

Q2: Name a metal which exists in liquid form?

Ans: A metal which exists in liquid form is mercury (Hg).

Q3: What is the nature of metal oxides?

Ans: The nature of metal oxides is basic.

Q4: Which group of metals is highly reactive?

Ans: The highly reactive group of metals is Group I.

Q5: Why sodium metals are more reactive than magnesium metal?

Ans: Because sodium metals having low ionization energy than magnesium metal having high ionization energy.

Q6: Name a metal which can be cut with knife?

Ans: Sodium metal is soft. It can be cut with knife.

Q7: Name the best ductile and malleable metal?

Ans: The best ductile and malleable metals are gold.

Q8: Name the metal which is the poorest conductor of heat?

Ans: The metal which is the poorest conductor of heat is lead (Pb).

Q9: Why alkali metals are more reactive than alkaline earth metals?

Ans: Because they have low ionization energies than alkaline earth metals.

Test Yourself 8.2

Q1: Why silver is not used in pure form?

Ans: Because it is very soft metal.

Q2: Why gold is used to make jewelry?

Ans: Because of its inertness in atmosphere.

Q3: Why platinum is used for making jewelry?

Ans: Because of its unique characteristics like colour, beauty, strength etc.

Test Yourself 8.3

Q1: Why fluorine is more nonmetallic than chlorine?

Ans: Because it has higher electronegativity than chlorine.

Q2: Can liquids and gases be brittle?

Ans: Liquids and gases cannot be brittle.

Q3: Why the oxygen is called nonmetals?

Ans: Because it has low boiling and melting points.

Q4: Name the most abundant nonmetal in the earth crust?

Ans: Oxygen is the most abundant nonmetal in the earth crust.

Q5: Name two nonmetals which are both brittle and nonmetals?

Ans: Phosphorous and Iodine.

Q6: Give the nonmetallic trend in halogens?

Ans: The nonmetallic trend in halogens decreases from top to bottom in the group.

Q7: Why HF a weak acid?

Ans: HF is a weak acid due to the presence of strong hydrogen bonding.

(Important Long Questions)

1. Describe the chemical reaction of sodium with water, oxygen, chlorine, and hydrogen?
2. Compare and construct the properties of alkali and alkaline earth metals?
3. Describe four important chemical properties of metals?
4. Define Nonmetals? State physical properties of non-metals.
5. Write four uses of magnesium?
6. Why are cations smaller and anions are bigger in size than their respective neutral atoms?
7. How can you compare the softness and hardness of metals?
8. Discuss the inert character of silver and gold?